update

SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

No. 50/Summer 1992

Tracking the Ebb and Flow of Life on Earth

Remote sensing images from satellites provide irrefutable evidence of humankind's technological power to increase or destroy our planet's productivity.

Photographic images of stark and sometimes savage beauty provide a chronicle of population growth and planetary losses enforced by human pressures on fragile ecosystems and the wasteful and polluting processes of industrial societies.

These overhead snapshots of life on earth have become an indispensible part of everyday life in rich and poor nations alike. They track the growth and failure of our food crops, the rise and fall of our water sources and the intimate details of climate systems that shape human existence on earth.

Symposium

Variations in global climate are so complex that long-term, consistent, global remote-sensing coverage by satellite is essential to understanding our environment; and for this reason, space technologies to study and monitor climate change have been a major focus of International Space Year activities in 1992. They were also the subject of a United Nations "Symposium on Space Technology for the Environment" at this year's United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro. Demonstrations given during the symposium illustrated remote-sensing capabilities and the economic advantages of using remote-sensing technologies for environmental management in developing nations. It also highlighted the economic and social advantages of using local experts to apply remote-sensing technologies in these countries.

GEOPIC

Satellite image of River Nile

Sponsorship

The United Nations Department of Economic and Social Development (DESD) sponsored and arranged for participants from 10 developing countries actively involved in remote sensing, geographical and land information systems and management to attend and participate in the demonstrations. The United States organizations EOSAT, ERDAS, ESRI and GEMPI also supported the event, which included the presentation of case studies and technical papers and workshops. Key lecturers included Dr. John Theon, Chief, Earth Science and Applications Office, NASA; Ms. Dunja Pastizzi-Ferencic, Director of the United Nations Science,Technology, Energy, Environment and Natural Resources Division (STEENRD); Mr. Buzz Sellman, Director, International Programmes, Consortium for International Earth Science Information Network; and Mr. Paul Uhlir, Assistant Executive Director, Physical Science and Math Applications, National Research Council.

(Cont. Pg. 2)

Inside

Vietnamese policy dialogue Pg. 2
Ergonomics and productivity Pg. 3
High-yielding crop research Pg. 4
Earth Summit and technology transfer Pg. 4
***ATAS News* supplement—Remote Sensing for Development**

International Space Year

The motivation to develop space sciences has not always been altruistic, but the cold war did generate extraordinary resources for research and spur progress which might not otherwise have been possible.

In the dawn of the post-cold war era, International Space Year 1992 and its theme, "Mission to Planet Earth", have helped focus attention on a new era for space activities. National space agencies and a number of international space organizations are working together under a Space Agency Forum on

(Cont. Pg. 2)

GEOPIC

Tracking Ebb and Flow
(*Cont. from Pg. 1*)

Graphic presentations covered solutions to problems associated with the management of natural resources and the environmental impact of development programmes in poor nations. They illustrated, among other things:

- The way in which run-off from oilfields and agricultural lands had polluted Lake Maracaibo in Venezuela;
- The assessment of forest and range resources in Zimbabwe;
- Crop-yield forecasting in Kenya;
- The role which the private sector can play in remote-sensing activities in developing countries.

Agenda 21

Issues related to technological cooperation and transfer ranked high on UNCED's Agenda 21. And in the context of United Nations priorities for the peaceful uses of outer space, this includes remote sensing to ensure that developing countries have:

- access to satellite data through ground receiving stations and image-processing systems;
- opportunities to exchange data, information and equipment relevant to their needs;
- the indigenous capacity to access and analyse data yielded by space sciences and technologies.

Applications

Potential applications for remote sensing and GIS include land use planning, mineral exploration, forestry and agriculture, water management, coastal zone management, marine and ocean resources management, early warning and natural disaster reduction, economic planning and the preservation of cultural heritage sites. ■

Vietnamese Policy Dialogue

Science and technology by nature is a cultural and socio-economic process which demands the widest possible understanding and participation of everyone affected. Effective development in this area also requires endogenous capacity—the institutional, infrastructural and human resources necessary to make informed, autonomous decisions about priorities and the strategies to achieve them.

With this in mind, the Science and Technology Branch is supporting a pilot project in six countries to establish a consensus for S&T development through "policy dialogues".

The first Policy Dialogue on Endogenous Capacity Building in Science and Technology for Development was held in Hanoi, Viet Nam, from 17-19 June this year, followed by others in Jamaica (23-24 June), Pakistan (1-3 September) and Togo (21-23 September). Other dialogues will follow in Cape Verde and Uganda.

The main objective of the Viet Nam dialogue was to discuss substantive papers dealing with the broad national situation as the country shifts direction from a centrally planned to a market-oriented economy. There were 26 participants in the dialogue, including scientists, engineers, producers, educators, policy makers and others with a stake in the growth of the economy. A second round of dialogues is planned for November 1992. ■

ESA Projects for African Nations

The European Space Agency (ESA) is working with the United Nations to develop pilot remote-sensing projects in Guinea-Conakry, Morocco, Nigeria and Tunisia. ESA plans to organize training towards the end of this year for experts who will help these countries to use remote-sensing data from Maspalomas, Grand Canary, Spain and Fucino, Italy. ■

International Space Year
(*Cont. from Pg. 1*)

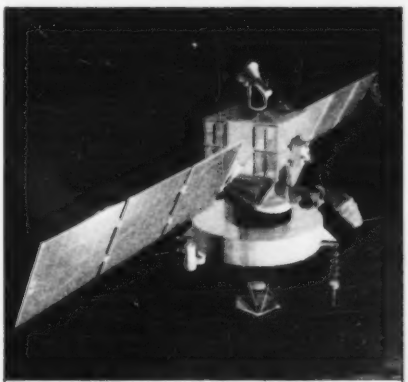
International Space Year (SAFISY) which now includes 29 space agency members and 10 affiliates, including the United Nations. Never before have so many space agencies agreed to cooperate for the betterment of humankind within a global framework.

Space fleet

SAFISY has drawn attention to the advantages of complementary national research activities which can maximize scientific returns, especially through data analysis. By merging data from independently operated national spacecraft during International Space Year, scientists have effectively drawn together the kind of yield one might expect from an international space fleet. One example is an agreement to use ocean observations from the France–United States TOPEX-Poseidon (Ocean Topography Experiment) satellite to support data interpretation from the European ERS-1 (European Remote Sensing Satellite) and the Japanese spacecraft JERS-1 (Japanese Earth Resource Satellite).

Scientists working within the SAFISY framework have helped to construct a pragmatic foundation for long-term cooperative space research based upon global research needs. And given their success, thought is now being given to a life for SAFISY beyond Space Year.

Activities being undertaken during International Space Year focus on three main areas: monitoring of the global environment and the resources of the Earth; education in space science, technology and applications; and public information and education relating to space activities and their benefits. ■



NASA

Artist's impression of TOPEX-Poseidon satellite

Miracle Coal Burns Clean

Through a miracle of nature, an Indonesian mining company has been marketing coal from a large deposit in Borneo, which has 80 per cent less sulfur than the cleanest coals consumed in the United States and many other countries.

The New York Times reports that the coal can be blended with dirtier coal and burned without the smokestack equipment used to control acid rain. The coal from Borneo also produces less carbon dioxide, the main greenhouse gas. Scientists believe that the quality of the coal is related to the fact that the mine site gets about eight feet of rain a year and might have been even wetter over the tens of millions of years it took to form the coal.

The existence of ultra-clean coal has intrigued energy specialists, such as Russell Seitz of the Olin Centre for Strategic Studies at Harvard University. "A cardinal rule of geology is that nothing happens only once", he told the *Times*.

Dr. Seitz said that because coal was so abundant in the United States, prospectors had largely stopped looking for it and might have overlooked significant deposits of ultra-clean coal.

"Everyone has coal coming out of their ears", he said. "But it's rotten, lousy coal." ■

Ergonomics and Human Understanding

The design of machine systems to maximize the potential of their human operators was the subject of a recent in-house seminar organized by the Science and Technology Branch. Ergonomist Dr. Martin Helander told participants that human capabilities and limitations must be factored into the design process early if optimal productivity, job safety and job satisfaction are to be achieved.

"The rapid development of technology has had a great impact on the role of humans in systems", Dr. Helander said. "From our perspective as ergonomists this has meant an increasing emphasis on human information processing and cognition. Where we once concerned ourselves almost exclusively with such issues as anthropometric design, work posture and visual performance, we are now forced to consider such issues as information-processing capacity and problem-solving abilities."

Dr. Helander cautioned that a rush to automate production at great financial expense to management and job opportunities for human workers could be a big mistake. He cited examples in which IBM and other large corporations had reversed themselves on automation and were currently in the process of designing robots out of the workplace.

Dr. Helander is Chairman of the Science and Technology Committee of the International Ergonomics Association. ■

WORLD WATCH

WORLD WATCH

Population and the Automobile

The world's automobile fleet is expanding at a rate of about 35 million vehicles a year. The total population of these gas-guzzling polluters grew from about 50 million units immediately after the Second World War to more than 450 million in 1986. And in [illegible] alone, 28 automobile-producing [illegible]ns built a record 46.2 million ve[illegible]s—many of them for export.

The world's automobile population is expected to reach 1 billion units by the year 2030, and given that a significant number will be driven by more affluent third worlders, it is clearly time to be giving some thought to their impact on third world environments.

At the present time, most third world pollution, particularly in urban areas, is transport-related. So too is the level of noise, and policy makers should be thinking about legislative measures to protect both the environment and the health of the general public.

Environmental policies should cover, among other things:

- air-quality standards and routine monitoring of transport-related pollution levels;
- quality control of transportation fuels;
- urban transport policies to promote mass-transit systems over private automobile use;
- noise limits;
- strict testing standards and controls on the types of automobiles allowed to be imported. ■

READEX
FICHE

Astronomical Returns on Agricultural Research

Agricultural research in Latin America is paying extraordinary dividends, according to the International Centre for Tropical Agriculture in Colombia (CIAT).

Three centres affiliated with the Consultative Group on International Agricultural Research (CGIAR) report food production returns in excess of $1 billion in 1990 on a $22.3 million investment on research into beans, maize and wheat that same year.

"Research is a high-risk activity with a high expected payoff", observes CIAT economist Dr. Luis Sanint. "Thirty-five studies on returns on research investments in Latin America during the past 20 years show social returns higher than 20 per cent. This is a profitable investment of public funds."

CIAT's investments cover the search for ways to increase food production, mainly through the development of improved crop varieties with resistance to climatic stress and insect predators. This work has resulted in a more than doubling of rice, maize, wheat and potato yields in the region between 1966 and 1989 and the increase in bean, beef and milk production by 12 per cent, 23 per cent and 34 per cent respectively between 1974 and 1989.

These gains, however, do not factor in benefits to the environment, which might be even greater than the direct monetary returns. Better farming practices, higher food productivity and agricultural income reduce pressure on peasant farmers to engage in shifting agriculture or to migrate to towns and cities, and greatly reduce the use of toxic chemicals to control crop pests. Integrated pest management promoted by the CIAT centres reduced spraying for pests in Colombia from nine applications a year in 1980 to just three appplications in 1990, and while 60 per cent of Venezuelan farmers sprayed both insecticides and fungicides on crops two or more times a year a decade ago, 90 per cent spray only once or never today.

"Recent research has shown that inexpensive integrated pest management practices, particularly pheromone traps, have been overwhelmingly effective in controlling sweet-potato weevil, which is by far the most important pest affecting poor people's food crops in the Caribbean," said Dr. Thomas S. Walker, an economist with the International Potato Centre in Peru (CIP). "Reports of the theft of pheromone traps from researchers' trials in farmers' fields indicate a high demand for this technology." ■

CIAT

Colombia: A farmer selects high-yielding bean seeds for neighbors

Earth Summit Grapples with Technology Transfer Issue

A centrepiece of this year's United Nations Conference on Environment and Development and its historic Agenda 21 was the controversial question of technology transfer to developing countries.

The three most intensively discussed paragraphs related to:

- Terms of transfer, with developing countries insisting that environmentally sound technologies be transferred on preferential and concessional terms. Many industrialized countries, however, held to their belief that market conditions should prevail.
- International business as an important vehicle for technology transfer.
- The abuse of intellectual property rights in the case of privately owned technologies.

Although there was no resolution of these differences, compromises were reached on all these points. By the time the Rio de Janeiro Earth Summit ended there was no doubt that issues related to science and technology for development had become embedded in the language and consciousness of all delegations. No fewer than 40 chapters of Agenda 21 have references to science and technology, and two of them deal exclusively with these important topics. ■

ATAS News

No. 17/Summer 1992

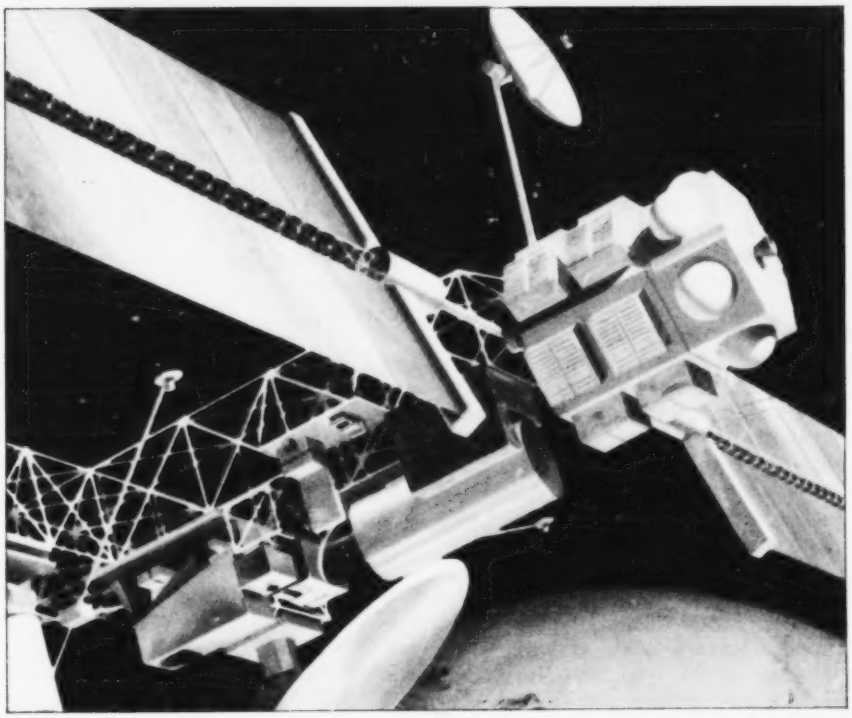
Remote Sensing and the Transfer of Technology

Technology transfer and the needs of developing countries was the subject of an interregional seminar co-sponsored by the United Nations Department of Economic and Social Development (DESD) and the International Society for Photogrammetry and Remote Sensing (ISPRS) in Washington, DC (2-14 August).

Three sessions were devoted to key issues covering the viewpoints of manufacturers and users of remote-sensing technologies, the education needs of developing countries to facilitate the transfer process and the integration and management of new technologies in recipient countries.

The first session focused on the need to accelerate the transfer of new mapping and remote-sensing technologies and the need for capable end-users. Papers presented by various experts examined the role of consultants, the importance of guidelines for State policies in the science and technology sector, the need to have on-the-job training and overseas fellowships as basic project components, the need to avoid the "testing" of new technologies in developing countries and the importance of ensuring that new technologies are integrated in terms of a nation's economy, educational opportunities, infrastructure, living standard, habits and attitudes towards technologies. It was emphasized that the choice of a technology is only one step in the transfer process. One suggestion from participants was for the United Nations to help developing countries to launch "user awareness" programmes that would foster an understanding of what could be expected of new technologies in any particular social and economic context.

(Cont. Pg. 2)



NASA

5,000 Attend Space Congress

Spacefaring nations sent more than 5,000 of their leading scientists to Washington, DC (28 August - 5 September) for a World Space Congress.

The Congress was the largest gathering of its kind in history, bringing together scientists from developing as well as industrialized countries to address the general theme of Discovery, Exploration and Cooperation. The event was co-sponsored by the United Nations, the International Astronautical Federation (IAF) and the Committee on Space Research (COSPAR). It was hosted and organized by the American Institute of Aeronautics and Astronautics (AIAA) and held under the auspices of the National Academy of Sciences and the National Aeronautics and Space Administration (NASA). The Congress was billed as the premier event for International Space Year and provided a forum for many cooperative projects initiated by the Space Agency Forum for International Space Year (SAFISY).

Programme

The programme included lectures and panel discussions involving the

(Cont. Pg. 2)

Remote Sensing
(*Cont. from Pg. 1*)

The second session dealt with education needs. Experts observed, among other things, that: the growth of modern mapping sciences in poorer countries had tended to rely on outsiders and were rarely controlled by indigenous scientists; developing countries needed to place more emphasis on applications and systems design; and there was a need for cooperation between specialists in different disciplines. Participants related experiences in Ethiopia, China and Jordan.

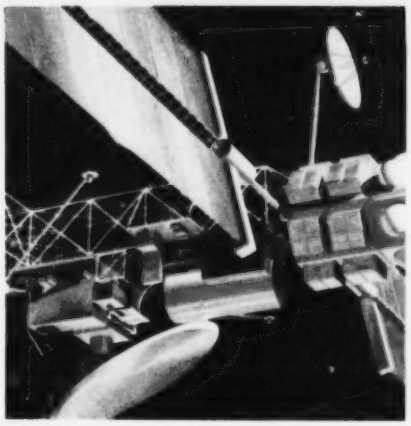
Data users

The third session placed emphasis on the software needs of data users and explored the launching of low-cost and low-weight satellites coupled with data compression and UHF ground reception through portable data receiving and processing equipment.

The seminar recommended, among other things, that:

- international societies, such as ISPRS, play a coordinating role in meeting technological and space application challenges;
- an international advisory group be established to help developing countries in the field of mapping sciences;
- a committee or commission be set up to ensure the participation of developing countries in major mapping science congresses. It was suggested that the United Nations provide sponsorship for third world participants;
- earth observation systems with portable data receiving and processing equipment be made available to developing countries;
- the United Nations give further consideration to technology transfer problems and provide guidelines for users;
- a follow-up seminar address the concerns of island countries in the Caribbean and the Pacific;
- special efforts be made to encourage women to enter professions associated with photogrammetry and remote sensing.

Keynote speakers at the symposium included representatives from Argentina, China, Indonesia, Pakistan, Syria, Egypt, Kenya, India, Malawi, Poland, Canada, the Netherlands, the United States and the United Kingdom. ■



NASA

Space Congress
(*Cont. from Pg. 1*)

world's leading thinkers and space policy makers. They reviewed the latest results and issues in the area of space science, engineering, law and policy, which will influence space programmes into the next century. The Congress also featured 100,000 square feet of displays depicting advanced space technology concepts.

Disaster reduction

In a session devoted to the importance of space technology for disaster reduction in developing countries, the point was made that technologies for humanitarian purposes had so far been underutilized. Natural disasters claim hundreds of thousands of lives and cause billions of dollars worth of losses to housing and infrastructure in the developing world every year. And participants noted that much of that pain and loss could be avoided if populations in the world's poorest countries had adequate warning of impending threats, such as storms, floods, earthquakes, drought and insect infestations, which posed a constant threat to their survival.

Technology transfer

Representatives of the industrialized nations were urged to be sensitive to the developing countries' needs for technology transfers. It was noted that a welcoming environment for new technologies was essential in developing countries if they were to be used to their full potential. It was also noted that the United Nations needed to increase its efforts to develop indigenous capacity in the space sciences through education and training.

Participants said it was important also to document lessons learned from natural disasters and to share information on approaches which had helped avoid or mitigate their impact.

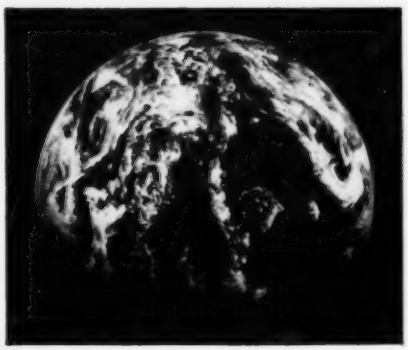
Symposium

The Congress was preceded by a symposium entitled "Space Technology in Developing Countries—Making it Happen" (28-30 August). The symposium covered ways in which officials from institutions and agencies in developing countries could identify, organize, finance and manage space activities that are adaptable to the needs, capabilities, development programmes and resources of their countries.

Mr. N. Jasentuliyana, Director of the United Nations Office for Outer Space Affairs, outlined what he said were the many obstacles to the full participation of developing countries in international space programmes. These included their limited resources for space programmes, difficulties in keeping up with rapid technological change and the inadequacy of mechanisms for sharing their experiences. Mr. Jasentuliyana said that the high cost and complexity of space technologies required that most developing countries be extremely selective in the scope and pace of their space activities.

"Each country must determine its priorities and make decisions concerning the allocation of economic and human resources based on those priorities", he said. "The costs of many space technologies also make it vital for developing countries to participate in space activities through international collaboration."

The United Nations Programme on Space Applications met travel and other expenses to enable a number of space scientists from developing countries to participate in the nine-day programme of events associated with the symposium and the Congress. ■



NASA

Geographic Information Systems Transform Mapmaking

Over the past two decades, Geographic Information Systems (GIS) have become the leading technology for organizing and storing cartographic data gathered by satellite imagery.

GIS technology enables researchers with low-cost personal computers and laptops to overlay thematic data—such as a species habitat, human settlements, bodies of water, mineral deposits or road networks—on integrated digital maps. Data can be built over time to paint pictures of an animal's migration or to analyse changes in habitat and predict a species' chances of survival. With environmental information digitally recorded and archived, researchers can conduct ongoing studies to understand the impact of natural and human actions on the environment.

The United Nations Science, Technology, Energy, Environment and Natural Resources Division (STEENRD) supports a range of technical-assistance projects to strengthen national mapping institutions in the developing world.

In the Kingdom of Bhutan, the Government plans to set up a comprehensive Land Use Survey. Existing maps are being digitized and land records are being computerized with help from UNDP and the Swedish Government.

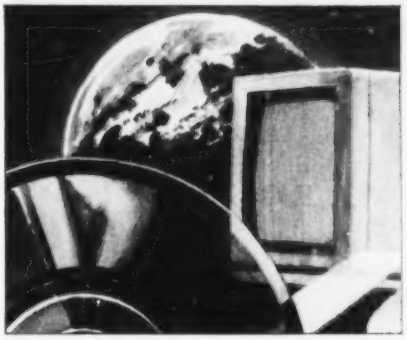
In Ethiopia, a remote-sensing unit has been equipped with a GIS programme, and thematic maps including soil surveys and land use have been prepared. The unit is conducting training courses in the use of remote-sensing data for a range of users outside of the Ethiopian Mapping Authority.

In India, a modern cartographic centre is equipped with a sophisticated GIS system, and the Government proposes to create an Inter-agency Techno-Managerial Group for the coordination of all national GIS activities.

In Jordan, the Royal Jordan Geographic Centre has been equipped with a top-of-the-line GIS and is currently preparing a basic GIS of the country by digitizing existing line maps and generating new digital maps. Special attention is being given to the acquisition and editing of data in Arabic script.

The Kingdom of Saudi Arabia is also establishing a sophisticated GIS based on digital mapping with many layers of data. It will eventually record all municipal areas of the country and form the basis for a comprehensive land-registration system. ■

This article draws on material published in the April issue of Earth Observation magazine.



ICAF

All For One One For All

Remote-sensing data from a variety of satellites are now available to all countries. So, too, are a variety of data-processing techniques and applications for planning and managing natural resources. These packages can be extraordinarily cost-effective, especially for larger developing countries, where ground surveys can be prohibitively slow and expensive to carry out.

A common approach to resource management is to prepare a detailed base map and resource inventory of an area and then monitor changes in the baseline conditions. The detailed inventory often makes extensive use of aircraft, ground surveys and existing maps and administrative information, while the monitoring of changes is left to the repetitive and consistent coverage of satellites. Baseline mapping can emphasize unchanging elements, such as geology, groundwater and soils, while satellite remote sensing covers more dynamic features, such as land use, urban development, forest clearing, cropping patterns and the water levels of lakes and reservoirs. Where remote-sensing satellites are unable to offer sufficiently frequent coverage—as in the case of changing crop and rangeland conditions through the growing season—meteorological satellites can fill in the picture on a daily basis.

The integration of all this information can pose major practical problems for information handlers; however, computer-based geographic information systems are evolving to handle data storage, recall and processing. This readily available capacity enables resource managers in rich and poor nations alike to generate custom maps and statistics which respond to specific information needs as they arise. ■

Assessment Survey

The Science and Technology Branch of STEENRD is exploring means of establishing closer institutional cooperation in the field of technology assessment. It has contacted 50 institutions worldwide which are involved in TA, together with more than 140 national science and technology focal points.

Institutions which are interested in participating in this survey, but which have not yet been approached by the Branch, should contact Mrs. Mary-Pat Silveira, STEENRD/DESD, 1 United Nations Plaza, New York, NY 10017, USA. ■

Dollars for Global Change Programme

United States President George Bush has asked Congress for $1.3 billion next year to accelerate research to develop reliable scientific predictions on which national and international policy responses to global climate change can be based. The first phase of NASA's Global Change Research Programme includes the launching of 16 free-flying satellites with international partners and three space shuttle missions to study climate change factors in the upper atmosphere. ■

The United Nations Role in Space

By N. Jasentuliyana

The United Nations has been a forum for international discussions relating to space activities and the environment for many years. But in the last few years, like many other organizations, it has paid increasing attention to the need to protect the environment, including the space environment.

The work of the United Nations relating to space activities and the environment focuses on the promotion of international cooperation in the use of space technology for monitoring the terrestrial environment; and working to ensure that space activities do not themselves cause damage to the space or Earth environment.

The efforts of the United Nations to promote international cooperation in space fall into two rather different categories. One is the negotiation of international political and legal agreements. For these efforts, the Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee are the primary forums, and the major participants are the space powers. The developing countries with space programmes, including Brazil, China and India, are playing an increasingly active role in the international policy debates, in particular with respect to the space and Earth environments.

Technical assistance

The second category of United Nations space activities is the provision of technical assistance to developing countries, mainly through the Programme on Space Applications. This Programme is overseen by the Committee on the Peaceful Uses of Outer Space, and the major participants are, of course, the developing countries. Efforts to promote the use of space technology for monitoring and protecting the terrestrial environment fall mainly into this category.

Education

The United Nations monitoring role has focused on education and training for developing countries. The Office for Outer Space Affairs, through its Programme on Space Applications, organizes short seminars, workshops and training courses and arranges for fellowships for long-term education through institutions in countries with advanced facilities. Since its inception in 1970, this Programme has concentrated its efforts on remote sensing, primarily for the purpose of economic development, but also for environmental monitoring and protection. Topics addressed in these training courses and seminars have included drought and desertification, deforestation, food security, locust control and the use of geographic information systems. In 1991, the programme organized its first training course devoted specifically to satellite remote-sensing applications for environmental assessment and monitoring.

Space information system

The Office for Outer Space Affairs also prepares and publishes reports and technical review papers on aspects of remote sensing of special interest to developing countries. Two recent studies concern desertification in developing countries and upper atmospheric weather and environment monitoring. The Office also provides technical advisory services to developing countries, and in order to help them obtain information for the effective use of space technology, it is establishing an international space information service.

Reducing dependence

To help developing countries reduce their dependence on developed countries in the space technology field, through regional cooperation, the United

Nations supports the Regional Centre for Services in Surveying, Mapping and Remote Sensing in Nairobi; the Regional Remote Sensing Programme in Bangkok; the Regional Centre for Training in Aerospace Surveys in Nigeria; the Regional Remote Sensing Centre in Burkina Faso; and the Space Conference of the Americas.

The Programme on Space Applications is also working to develop regional centres for space science and technology education in developing countries. A number of developing countries have expressed interest in hosting these centres, which, in their first phase, would concentrate on training in remote sensing, including environmental monitoring.

The United Nations and its specialized agencies will organize more than 40 conferences, seminars, training courses and workshops in the fields of remote sensing, meteorology and environmental monitoring during 1992-1993. These activities are being coordinated with the activities of other international organizations, particularly with those of the European Space Agency, Intelsat and Inmarsat, and non-governmental organizations, including the Committee on Space Research (COSPAR) and the International Astronautical Federation (IAF). ■

About the Author: N. Jasentuliyana is chief of the United Nations Office for Outer Space Affairs. More information about the role of the United Nations in Space is available on request from: The Office for Outer Space Affairs Room 3260, United Nations, New York, NY 10017.

ATAS News is a regular supplement to the *Update* newsletter of the Science, Technology, Energy, Environment and Natural Resources Division (STEENRD). Its objectives are to inform scientists and planners of activities in technology assessment and forecasting, to serve as an information medium for the ATAS Technology Assessment Network and to highlight the implications of new technologies for developing countries. *ATAS News* offers readers an open forum to address these and related issues at the national, regional and international levels. Submissions for publication are welcome.

Newsworthy articles, special reports, and photographs and other illustrative material should be sent to: The Science and Technology Branch, 1 U.N. Plaza, N.Y., N.Y. 10017, USA. Telex 232422 UNHUR and 62450 UNATIONS. Cable, UNATIONS NEW YORK. Telefax (212) 9634116.

ATAS News is edited by Ian Steele. ■

UN Organizations Active in Space

A number of United Nations bodies in addition to the Office for Outer Space Affairs rely on space technologies for environmental monitoring.

• The United Nations Environment Programme (UNEP) manages a Global Environmental Monitoring System (GEMS) and a Global Resource Information Database (GRID), both of which use satellite data. The main areas of concern are climate, pollution and renewable resources. UNEP also provides technical assistance for projects in environmental management as well as training in the use of remote sensing and geographic information systems for environmental purposes.

• The Food and Agriculture Organization (FAO) makes extensive use of environmental monitoring by satellite through its Remote Sensing Centre in Rome. One of the Centre's responsibilities is to provide environmental data to the Global Information and Early Warning System on Food and Agriculture, which disseminates information on drought, soil degradation, desert locust control and desertification. The Centre also draws on imaging satellites to monitor precipitation and vegetation cover in Africa.

• The World Health Organization (WHO) uses an information system for famine management in Africa, and

• the World Meteorological Organization (WMO) coordinates a global exchange of weather and climate data through the World Weather Watch,

• the United Nations Disaster Relief Organization (UNDRO) uses satellites for its disaster relief programmes.

• Other branches of the United Nations system which have space-based activities related to the environment include the new Science, Technology, Energy, Environment and Natural Resources Division (STEENRD), the Office for Outer Space Affairs and its Programme on Space Applications, regional economic commissions, UNESCO and the International Maritime Organization (IMO). ■

IGBP

protection of the environment and of humankind from natural disasters;

• When one country acquires data over another country, the "sensed" country should be given access to that data on a non-discriminatory basis and on reasonable cost terms.

To maximize availability of the benefits to be gained from remote sensing, these principles encourage regional cooperation in the establishment and operation of collection, storage, processing and interpretation facilities. ■

Peaceful Uses of Outer Space

In 1958, shortly after the launching of the first artificial satellite, the United Nations formally recognized a new potential for international conflict by establishing an ad hoc Committee on the Peaceful Uses of Outer Space. A year later the Committee became a permanent body, and as human endeavours in space expanded, so did the membership—from 18 to 53 this year, with more than half of those members drawn from the developing world.

Safeguards

The Committee has helped to develop five international legal instruments to safeguard humankind's entitlements in space and security on Earth. They are:

• A Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies;

• An Agreement on the Rescue and Return of Astronauts, and the Return of Objects Launched into Outer Space;

• A Convention on International Liability for Damage Caused by Space Objects;

• A Convention on Registration of Objects Launched into Outer Space; and

• An Agreement Covering the Activities of States on the Moon and Other Celestial Bodies.

Remote sensing obligations

A Legal Subcommittee has considered principles ranging from the use of satellites for direct television broadcasting to the use of nuclear power sources in space. In the area of remote sensing, the Subcommittee has elaborated a set of principles which provide that:

• Remote sensing activities should be carried out for the benefit of all countries and give particular consideration to the needs of developing countries;

• Remote sensing should promote the

Washington Assessment Meeting

The International Association for Impact Assessment (IAIA) focused its annual meeting (17-21 August) on the United Nations Earth Summit and the subject "Industrial and Third World Environmental Assessment: The Urgent Transition to Sustainability".

The Science and Technology Branch of STEENRD has maintained close ties to IAIA and is currently discussing the possibility of holding a joint training workshop on Technology Assessment Management in conjunction with next year's IAIA congress, which is to be held in Shanghai, China. ■

For further information please contact: Maurice E. Voland, Executive Director, International Association for Impact Assessment (IAIA), P.O. Box 70, Belhaven, NC 27810, USA.Tel: (919) 964-2338. FAX (919) 964-2340.

Developing Indigenous Remote Sensing Capacity

Although remote-sensing technologies have been available for many years, the fundamental chain of scientific and technological capacity needed to apply them appears to have been suppressed in developing countries by a desire for immediate practical results. This haste to reap the benefits of new technologies, although understandable, has led, among other things, to a limited understanding of the principles applied; perpetuated a dependency on outside consultants; or generated results of limited scope or of poor quality.

Hospitable environments

Developing countries must look beyond what a technology can do and understand how and why it works in a particular way. Years of haphazard technology transfer have demonstrated all too clearly that users must interact with producers in ways which enable them to relate to significant aspects of the technology's development and application. User countries need an autonomous basic research capability in scientific and technical disciplines, including those related to space. There should be public awareness of space sciences and technologies, coupled with education and training for those who are motivated to pursue careers in this field.

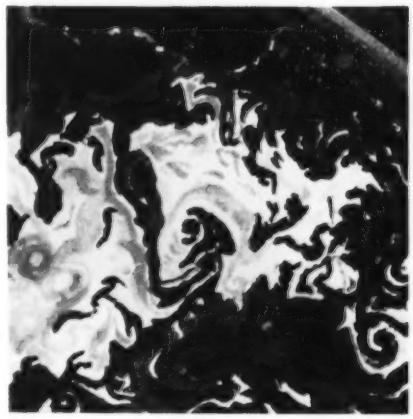
UN Agencies

The United Nations and its specialized agencies have supported short-term training courses, workshops, fellowships and other activities to build indigenous capacity since 1968.

Forthcoming events supported by the United Nations Space Applications Programme include:

• The Seventh UN/FAO/WMO/ESA Training Course on the Use of Visible, Infrared and Radar Systems in Hydrological and Agrometeorological Applications (Sept.- Oct. 1992). The course will be held in Nairobi to develop the practical skills of user agencies in the application of Earth resources and environmental data from current and future satellites.

• The Fourth International Training Course on Remote Sensing Applications to Geological Sciences (Oct. 1992). The course will be held in Berlin/Potsdam to provide education and practical training on the applications of airborne and satellite remote-sensing techniques to geological sciences.



• United Nations Conference on Communications Technology for Development (Nov. 1992). The conference will be held at ESCAP headquarters in Bangkok to address the roles of telecommunications, tele-medicine, disaster mitigation, tele-education and data transmission. ■

Beating Swords into Satellites

Space technologies for civilian use are generally inferior to those developed for military purposes, particularly in the area of high-resolution monitoring. But the application of the very best technologies for peaceful purposes is now very much in prospect as the leading military powers explore the dividends of conversion from military production to peaceful civilian purposes. The margin for improved environmental monitoring, resource exploration and development worldwide is vast, and with that in mind an international conference on conversion to be held in Moscow (12-16 October) will focus on aerospace technologies as its first order of business. In economic terms, the aerospace industry is the leading sector of the global defence industry. It is the most advanced technologically, and it is the major contractor of defence-related research and development.

The conference, entitled Technology Assessment in Conversion for Development, has been organized by the Science and Technology Branch of STEENRD and the Government of the Russian Federation. There will be about 100 international participants, including scientists, entrepreneurs, planners and policy makers. Four working groups will investigate the potential for follow-up activities under the headings Missiles and Launchers, Communication and Navigation, Remote Sensing and Environmental Monitoring, and Aviation.

The conference follows similar events co-sponsored by the former Centre for Science and Technology for Development in Beijing (October 1991) and Dortmund (February 1992).

For further information please contact: Mr. M. Maupoix or Mr. E. Omeljanovsky, ST/STEENRD/DESD, 1 United Nations Plaza, 10th floor, New York, NY 10017, USA. Tel: (212) 963-8812. ■

Remote Sensing at Work Images and Answers

Remote sensing data are collected by satellites and aircraft carrying a variety of sensors, including photographic cameras, electronic multispectral scanners, thermal infrared scanners and imaging radar systems. The data are then combined with information gathered from maps or ground surveys. While remote-sensing satellites provide detailed images of the Earth for the study of natural resources, meteorological satellites produce less detailed but more frequent pictures of larger surface areas, primarily for weather forecasting. However, meteorological satellite data, when used for rainfall estimates in particular, can provide important information for the management of land and water resources. Images of cloud-free areas can be used to estimate the condition of rangeland vegetation as well as crops.

Remote-sensing from the United States 'Landsat' and French 'SPOT' satellites provides detailed ground images on a world-wide and repetitive basis. Landsat and SPOT satellites pass over every country in the world in low-Earth orbits, collecting data through electronic multispectral scanners and transmitting them to ground stations for processing and distribution.

Scanners

Data from multispectral scanners are often distributed in the form of images that look very much like photographs, but the process of acquisition is quite different from the photographic process. Sensors scan the ground line-by-line as the satellite travels overhead, electronically measuring light according to its intensity and converting the readings to numbers, which are transmitted to the ground by radio. The numbers are received and processed by computer and recorded on paper or film point-by-point and line-by-line to reconstruct a photograph-like image of the scene observed by the satellite. Remote sensing does not necessarily involve the production of images, since computers may use the data to produce statistics or other forms of information, but most applications involve physical images at some point in the process.

Most of the research and development for the application of space technologies to land and water resources management has been done in the industrialized countries, although an increasing amount is also being done in the developing world. Much of the work has focused on the commercial development of land and water resources, but some has also been applied to the small-scale needs of villagers in many developing countries.

India

In India, satellite remote sensing has been combined with aerial and ground surveys to compare the groundwater yield of different areas. The data produced have enabled well drillers to double their success rates from about 45 per cent to 90 per cent. Satellite imaging has been found to be not only more cost-effective than aerial or ground surveys, but also able to reveal subtle hydrogeological structures that are invisible to ground observers. India's remote-sensing programme uses both photo interpretation and computer analysis of remote-sensing images to obtain information on drainage, topography, geomorphology, rock type, geological structure, soils and vegetation.

Burkina Faso

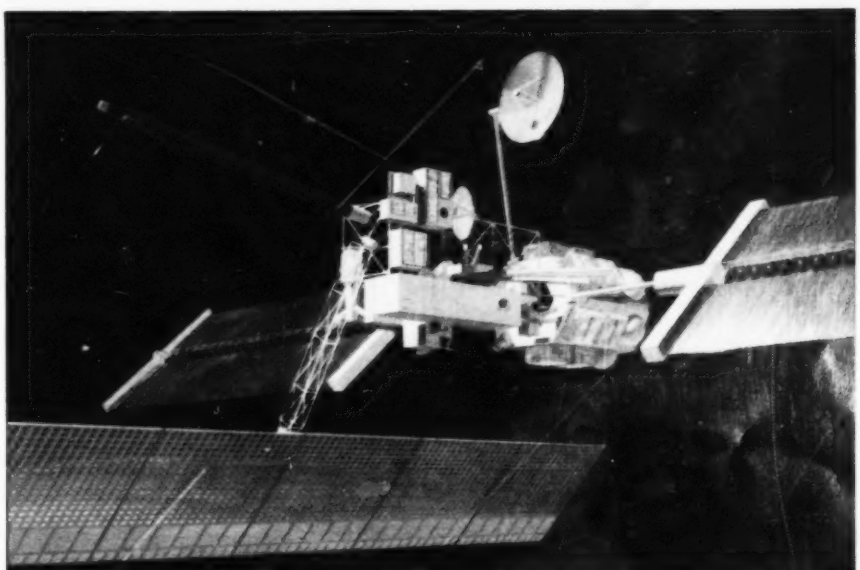
In Burkina Faso, satellite data were used to prepare a national inventory of small reservoirs and to identify sites for the construction of others. Seasonal data were measured and compared over a period of years to monitor changes in water levels as well as the deterioration of old reservoirs.

Amazonia

In the Amazonia region of Brazil, forests play a vital role in regulating water supply. Deforestation of steep slopes, either for logging or for agriculture, greatly increases the velocity of surface run-off and erosion rates, thereby reducing the productivity of the land. Remote sensing has been used to predict flooding and to sound the alarm for populations in vulnerable areas.

Africa

In Kenya and Senegal, remote-sensing satellites have been used to estimate biomass in semi-arid areas, to study the use of rangelands by pastoralists and to plan range-management programmes. Data from repeated satellite overpasses have also been used to monitor the changing quality, quantity and distribution of vegetation, together with the number and distribution of cattle, sheep, goats and human populations. This information enables scientists to assess ecological imbalances and take preventive action to promote sustainable agricultural practices. ■



NASA

Artist's impression of an earth observation system to be stationed by NASA above the polar ice cap

Japan to Host Asia-Pacific Conference

The difficulty scientists have in understanding global change is well illustrated by their differences over the extent of global warming. Although it is currently impossible to directly detect global temperature change through satellite remote sensing, space data has produced some important findings. It has been found that solar irradiation fluctuates by several percentage points; that clouds not only cool the Earth but, in some cases, warm it; and that the El Niño current is a part of a large sea-surface temperature anomaly in the Pacific Ocean.

Based on these findings and mathematical global circulation models, earth scientists now believe there are many factors, cycles and processes which affect global warming. These include the greenhouse effect, trace gases, the carbon cycle, the hydrological cycle, atmosphere-ocean interactions and deforestation.

New launching

Since 1972, the National Space Development Agency of Japan has launched and has been operating a series of Geostationary Meteorological Satellites and two Marine Observation Satellites. And in February it launched the Japanese Earth Resources Satellite, from which ocean and ice processes might be better understood. It is developing an Advanced Earth Observing Satellite scheduled for launching in 1995 and will also be part of a Tropical Rainfall Measuring Mission in cooperation with NASA of the United States.

Conference

An Asia-Pacific conference for International Space Year will be held in Tokyo in November to explore the year's theme, "Mission to Planet Earth", with a special focus on deforestation. The deterioration of tropical forests is the region's number one concern at the present time. Deforestation induces flooding, soil erosion, landslides and other natural disasters which claim many thousands of lives every year and extract a heavy economic price for the repair and reconstruction of damaged property and other infrastructure.

Discussions at the Asia-Pacific ISY Conference will consider concepts for regional cooperation in applying space remote sensing technology to the monitoring of forests, disaster prevention and other environmental issues. ■

ESA

Indigenous capacity is essential

SPOT Data for Africa and Asia

A French satellite which can gather detailed information to order anywhere in the world every five days has been placed within reach of developing countries in Africa and Asia through outside sponsors, which include the World Bank and the European Economic Community.

France's commercial SPOT satellite is being used to monitor renewable natural resources in the Sahel and for cartography and land-use statistical gathering in the Philippines. It is also providing data for agricultural assistance projects and the management of irrigated areas in Morocco, Indonesia, Burkina Faso, Mali and Chad.

Comprehensive coverage from the SPOT satellite enables a precise evaluation to be made of forested areas and their composition in terms of species, age and density as well as soil deterioration through erosion.

Climate research

As part of the International Geosphere-Biosphere Programme (IGBP), France recently created in Toulouse a network for regional climate research to cover the entire Mediterranean basin and subtropical Africa. The network will improve three-dimensional climate modelling for forecasting the local effects of global climate change, to develop climate databases and to undertake education and training activities.

Deforestation

A joint project to produce a cartographic inventory of deforestation in South-East Asia and to train national experts to monitor tropical forests is also being supported by France and the South-East Asian Ministers of Education Organization (SEAMEO) in Brunei, Indonesia, Malaysia, the Philippines and Thailand. ■

For further information, contact:

The Science and Technology Branch
United Nations
New York, New York 10017
United States of America
Telephone: (212) 963-8435
Fax: (212) 963-1267

Update and ATAS News
Edited by Ian Steele

A periodic newsletter to provide information on the progress made and related to the Vienna Programme of Action on Science and Technology for Development.

UPDATE is a quarterly publication of the Science, Technology, Energy, Environment and Natural Resources Division (STEENRD). It is prepared, edited, published and distributed by the Science and Technology Branch free of charge to all Member States, national focal points and intergovernmental and non-governmental organizations as well as to individuals upon request.